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Global Research Trends of Cyberbullying and the Metaverse in the Virtual World: Bibliometric Analysis Using the Scopus Database

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Abstract: Cyberbullying has evolved from a traditional form of bullying to a more complex digital form. One of the latest aspects of this development is the emergence of the metaverse as a new arena for cyberbullying behavior. This topic has received attention in research, signaling the need for in-depth studies to understand the impact and new mechanisms of existing challenges. The research aims to identify key trends and topics in the literature on cyberbullying and the metaverse, as well as to describe the productivity of countries, institutions, authors, and publication sources. Using bibliometric analysis, the study investigates the development of research in this field over the past few years. The PRISMA method was used in the document selection process, and nine documents were found published from 2022 to 2024, including journal articles, books, and conference papers. The results of the study show that there is a significant trend and interest in cyberbullying, the metaverse, and virtual reality as the main topics. However, research linking cyberbullying to the metaverse is still limited and separate, suggesting an urgent need for research that integrates these two fields.

Keywords: *cyberbullying, metaverse, virtual reality, cybercrime, global research trends, bibliometric analysis.*

Introduction

The rapid development of information and communication technology has brought humans into an increasingly complex digital era, where social interaction is no longer limited to physical space. The virtual world has evolved from just an entertainment medium to a significant space for social interaction, especially among the younger generation. According to Kaur, G., et al., 2024, the digital world has opened up great opportunities for the emergence of new phenomena such as cyberbullying, which is defined as the use of information and communication technologies to commit repeated acts of aggression against individuals who cannot easily defend themselves. Its impact on the mental and emotional health of victims has become a global concern (Bansal et al., 2023).

Cyberbullying has been a major focus of research over the past decade, with many studies examining its psychological impact on children and adolescents. Research by Upadhyay et al. (2023) shows that cyberbullying is growing in this environment, which brings new threats to users in virtual interactions. This is supported by research conducted by Hinduja and Patchin (2010), which identifies that victims of cyberbullying are more likely to experience depression, anxiety, and decreased academic performance. Anonymity in the virtual world often exacerbates this situation, where the perpetrator feels protected from legal and social consequences (Łosiak-Pilch et al., 2022). Barlett and Gentile (2012) add that cyberbullying is often more dangerous than traditional bullying due to its rapid and widespread spread, as well as

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the difficulty of removing harmful content from the internet. The ever-evolving digital environment can exacerbate the impact of cyberbullying, especially during its peak during the COVID-19 pandemic. Marinoni et al. (2024) showed that during the COVID-19 pandemic, girls were more vulnerable to cyberbullying through social media, while boys were more vulnerable to cybervictimization in online gaming, which was affected by the time spent online.

A significant shift has occurred from traditional social media platforms to more immersive virtual worlds such as the metaverse. Technological advances have led us to the concept of the metaverse, which was first introduced by Stephenson in 1992 in his novel "Snow Crash," describing the metaverse as a virtual world where individuals can interact with each other and with a digital environment as if they were in the real world (Wijaya, 2022). The metaverse offers a more immersive and realistic virtual experience compared to conventional digital platforms (Cruz and Oliveira, 2024). However, along with this potential comes new challenges, including more complex and limitless forms of bullying in this immersive environment. The phenomenon of the disinhibition effect, in which social barriers disappear in cyberspace, also exacerbates aggressive behaviors such as bullying in the metaverse (Suler, 2004). Walther et al. (2015) mentioned that the immersive aspect of the metaverse can exacerbate the psychological impact of bullying, where negative experiences in the virtual world can feel just as real and damaging as in the physical world. Di Pomponio and Cerniglia (2024) highlighted that the use of social media and experiences in the metaverse can have a significant impact on an individual's psychological well-being, both positively and negatively, by identifying how social interactions and virtual activities affect users' mental health. Livingstone et al. (2022) argue that we are currently at a tipping point where a deep understanding of bullying in the virtual world is urgently needed to prevent damaging long-term impacts. Huang and Chou (2010) emphasized the importance of understanding this new dynamic due to the high complexity and emotional involvement in interactions in the metaverse.

A significant increase in interest in cyberbullying and the metaverse has occurred, especially since 2019. Many studies focus on the impact of online interactions on children and adolescents (Fatmawati and Haryanto, 2023). In 2022, the metaverse became a popular topic across various disciplines, but there are still few studies that explore the direct relationship between cyberbullying and the metaverse, especially in the approach to education (Cassandra et al., 2023). The metaverse, with its immersive virtual reality and anonymity, brings new risks to users, especially vulnerable groups such as children and adolescents. Therefore, it is important to study this matter. Most of the research, such as the one conducted by Kim (2021), focuses more on the commercial aspects of the metaverse compared to social issues like cyberbullying. Research by Qasem et al. (2022) highlights how communication and interaction in the metaverse can create an environment that is vulnerable to cyberbullying, especially when users vent stress in virtual spaces. The study supports the need for clear policies from metaverse platforms to prevent such behavior. However, although many studies have explored the technological and social dynamics in the metaverse, as revealed by Vandebosch and van Cleemput (2009) and Cleemput et al. (2014), the main focus is still more on technology than on the educational approach to overcoming cyberbullying. Achuthan, Nair, et al. (2023) also show that online exploitation and cyberbullying are growing on various social media platforms, but their application in the metaverse is still minimal in the literature. A study by Hendry et al. (2023) highlights prevention strategies through education and technology consulting, but does not fully target policy intervention areas in the metaverse.

Some research, such as the one conducted by Boboc and Damaševičius (2024), discusses the use of extended reality (XR) technology to address bullying but does not specifically research the metaverse. Meanwhile, Ivanov and Ramos (2020) propose the use of role-playing in virtual environments to address bullying, but its integration with the metaverse has not been fully researched. Fadhel et al. (2024) uncover the role of AI in creating immersive virtual environments in the metaverse, where social behaviors such as cyberbullying can emerge and evolve; however, the study has not yet fully identified areas that require policy intervention. Kiriakidis et al. (2019) add that understanding this new form of bullying is a crucial step in developing relevant policies and interventions in the digital era. However, the study focuses more on the technological aspect than the educational approach to addressing this problem. Additionally, global research trends show an increase in cross-cultural collaboration in cyberbullying research, with the United States leading the number of publications, followed by significant contributions from Asian countries (Peker and Yalçın, 2022; Peker and Yalçın, 2022). Currently, Ireland is the country with the highest research impact (Li and Li, 2024). These studies often highlight how the COVID-19 pandemic

exacerbated cyberbullying incidents due to increased digital dependence. Meanwhile, metaverse-related publications saw a significant surge in 2022, with Singapore, Japan, China, and the United Kingdom as the main contributors (Bizel, 2023). However, there has been no in-depth research focused on cyberbullying and metaverse research trends by exploring the interaction between cyberbullying and the metaverse. Although publications in both areas continue to increase, there are still deep shortcomings in the literature. Existing research is still limited to a few countries, and the involvement of studies in the literature has not fully met the need for a more comprehensive and in-depth analysis of the interaction between the metaverse and cyberbullying.

This study seeks to explore gaps in the existing literature by conducting a comprehensive bibliometric analysis of global research trends on cyberbullying and the metaverse, using data from the Scopus database. It aims to provide an overview of the need for further research to fill the research gap regarding cyberbullying and the metaverse, as well as its implications in education.

Research Objectives and Questions

The purpose of this research is to identify key trends and topics in the literature on cyberbullying and the metaverse, as well as to describe the productivity of countries, institutions, authors, and publication sources. This analysis reveals increasing publication trends, identifies key research themes, and highlights potential areas for future research. This research specifically seeks to answer the following questions:

Research Question 1: "What is the trend of research development on cyberbullying and the metaverse in recent years?"

Research Question 2: "Which countries and universities are making a major contribution to cyberbullying and metaverse research?"

Research Question 3: "Which authors and sources have made major contributions to cyberbullying and metaverse research?"

Research Question 4: "What is the dominant topic in cyberbullying and metaverse research?"

Materials and Methods

This research is a bibliometric study conducted to systematically identify the literature (Burgos, 2024). This research is known as text data mining, and in its development, it is often referred to as the big data method (Hassani et al., n.d.). This method adopts a five-stage approach (Tranfield et al., 2003). The research will involve bibliometric mapping using tools such as Biblioshiny to analyze global research trends (Nurhayati, 2024). Bibliometrics can uncover research trends, identify research shortcomings, and explore the relationships between studies (Ardiansyahroni et al., 2023).

Figure 1. Five-step method bibliometric analysis

Determine Search Keywords

By using bibliometric mapping and keyword analysis of indexed articles, this study aims to understand the themes as well as the research groups relevant to the topic. This approach helps researchers gain in-depth insights into the development and contribution of a field of science and measure the impact of research on the scientific community (Sumedang, 2024). The first step in this method is to collect data through the academic database "Scopus," using specific keywords, namely "cyberbullying" and "metaverse." The search process will follow clear inclusion criteria by including empirical studies that measure the relationship of cyberbullying in the context of the virtual world.

Initial Search results

From the search results on the Scopus database on July 23, 2024, 23 documents were found to have been published with these keywords. The documents identified are in the form of scientific articles, books, and conference proceedings relevant to the topic of cyberbullying and the metaverse in the context of the virtual world. The time range for the publication of the documents is from 2022 to 2024, which shows that the documents are still relatively new.

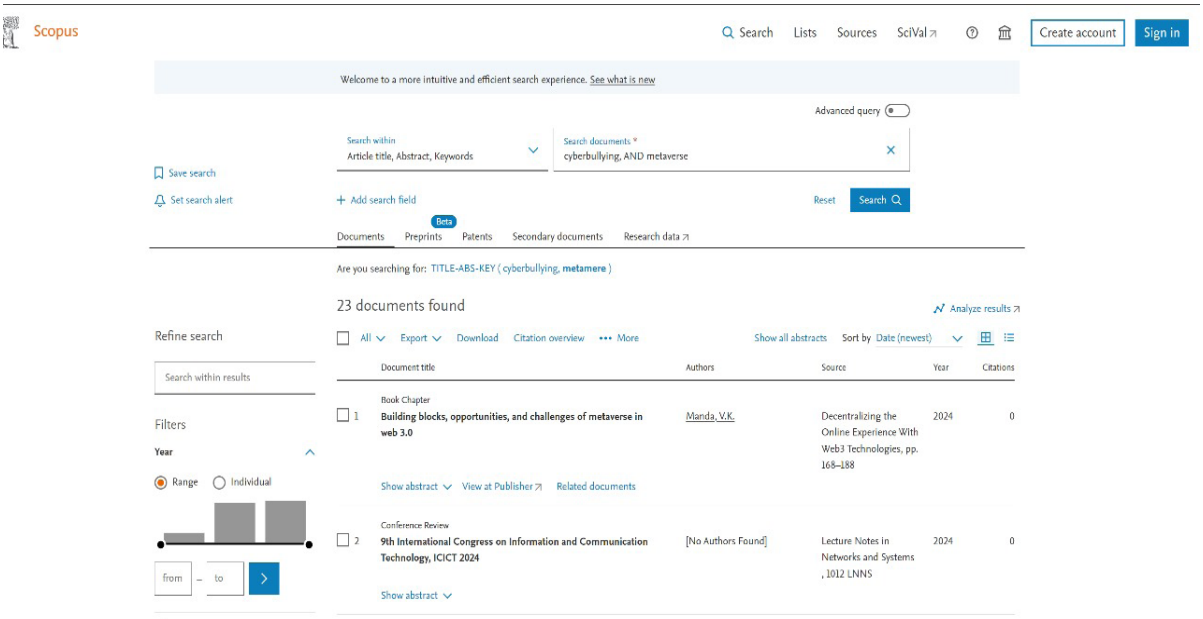

Figure 2. Meta data mining results on Scopus database

Refinement of Search Results

Documents will first be filtered by title and abstract. Irrelevant documents are eliminated at this stage, followed by a full review to ascertain whether they are relevant to the purpose of the study. In this stage, the PRISMA method is used to ensure that the document selection process is carried out in a transparent and usable manner (Liberati et al., 2009).

The prism process helps to select relevant and valid documents from the initial search results by setting filters based on the criteria of document type, keywords, and language (English). Of the 23 documents found through a search in Scopus, as many as 9 documents were selected for further analysis after going through the stages of identification, screening, and feasibility assessment. No documents were disqualified due to incomplete or irrelevant information.

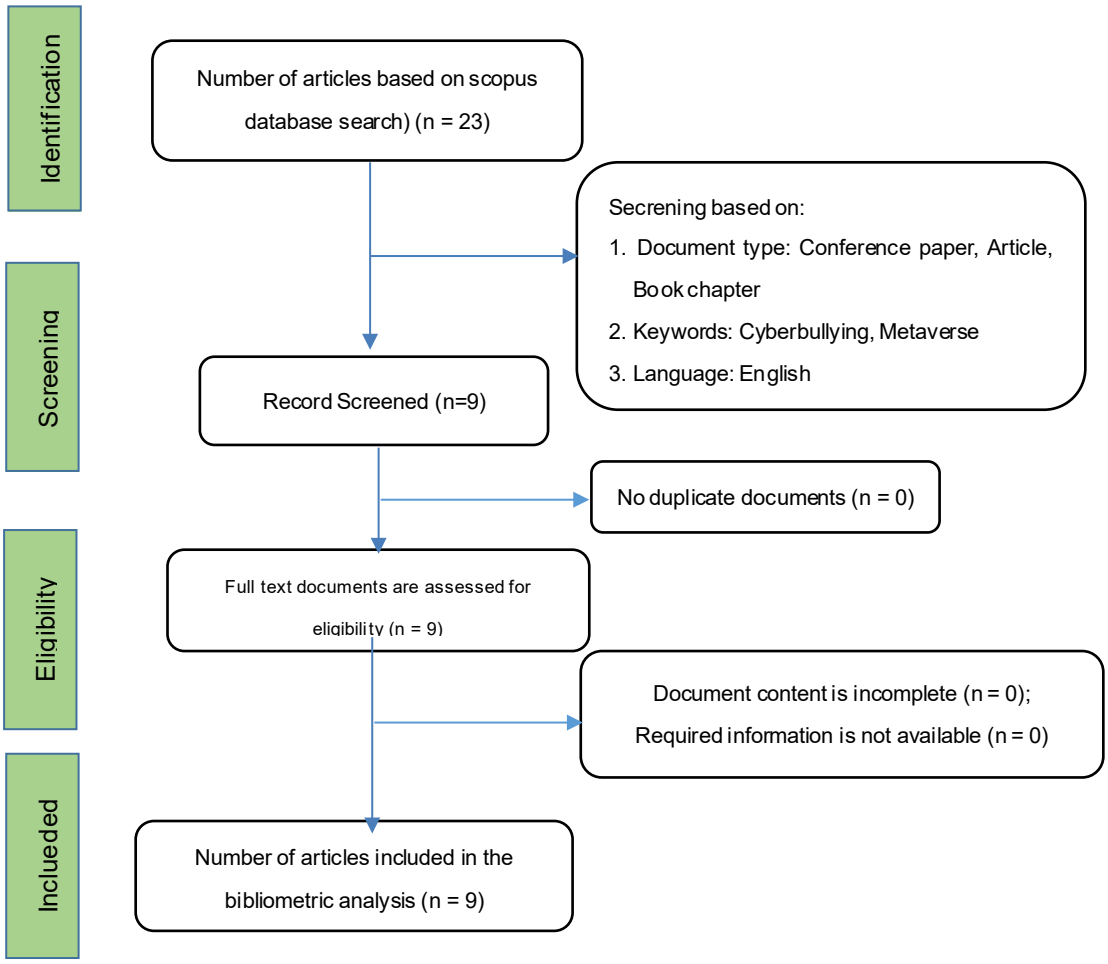
Identification
Screening
Eligibility
Included
Number of articles based on scopus database search) (n = 23)
Secrening based on:
1. Document type: Conference paper, Article, Book chapter
2. Keywords: Cyberbullying, Metaverse
3. Language: English
Record Screened (n=9)
No duplicate documents (n = 0)
Full text documents are assessed for eligibility (n = 9)
Document content is incomplete (n = 0);
Required information is not available (n = 0)
Number of articles included in the bibliometric analysis (n = 9)

Figure 3. Stages of the PRISMA method

Compile Preliminary Data Statistics

The data collected from the 9 documents were then categorized based on several components, including the year of publication, volume, and number of citations. Each component is inspected to ensure the completeness and accuracy of the data. In addition, the source of publication and the name of the publisher of each document are also analyzed to understand the distribution and origin of the publication.

Data Analysis

Once the relevant documents have been selected, the next step is data analysis. Bibliometric analysis involves publication calculations, citation analysis, and trend identification (Santika et al., 2024). This process includes defining search keywords, conducting initial searches, filtering results, collecting statistics, and analyzing data. To answer the research question, it employs three main approaches. First, a performance analysis is carried out by calculating the number of citations and publications from research topics. Furthermore, mapping is used to describe research topics that often appear in the dataset through tree maps, as well as to track their temporal trends with plots depicting thematic evolution. Finally, network analysis is conducted through keyword co-occurrence to reveal the relationship between keywords in the same document, as well as to identify keyword clusters that form the core topic in the research field.

Results

Research Question 1: "What is the trend of research development on cyberbullying and the metaverse in recent years?"

1. General Statistical Information and Research Trends

The results of this study provide an overview of research trends and statistical information from published documents. It was found that there were nine documents published in the period from 2022 to 2024.

Table 1. Research Trends

Description	Results
MAIN INFORMATION ABOUT DATA	
Timespan	2022:2024
Sources (Journals, Books, etc)	9
Documents	9
Annual Growth Rate %	100
Document Average Age	0.667
Average citations per doc	2.444
DOCUMENT CONTENTS	
Keywords Plus (EN)	85
Author's Keywords (DE)	32
AUTHORS	
Authors	40
Authors of single-authored docs	0
AUTHORS COLLABORATION	
Single-authored docs	0
Co-Authors per Doc	4.44
International co-authorships %	11.11
DOCUMENT TYPES	
article	3
book chapter	1
Conference Paper	4
letter	1

This table shows that there are nine documents issued from 2022 to 2024, with an annual growth rate of 100%. This indicates a significant increase in the number of publications. These documents are still relatively new, with an average age of 0.67 years, and have earned an average of 2,444 citations per document, which reflects a good initial impact. There are 85 additional keywords and 32 author keywords, reflecting the broad scope and variety of research topics in the field being studied. All documents are the result of collaboration, involving a total of 40 authors with an average of 4.44 authors per document. The level of international collaboration reached 11.11%, indicating the existence of cross-border cooperation in this study. The types of documents published include three journal articles, one book chapter, four conference papers, and one letter. This type of document signifies substantial contributions in various academic forums, as well as rapid growth in research in the field being studied.

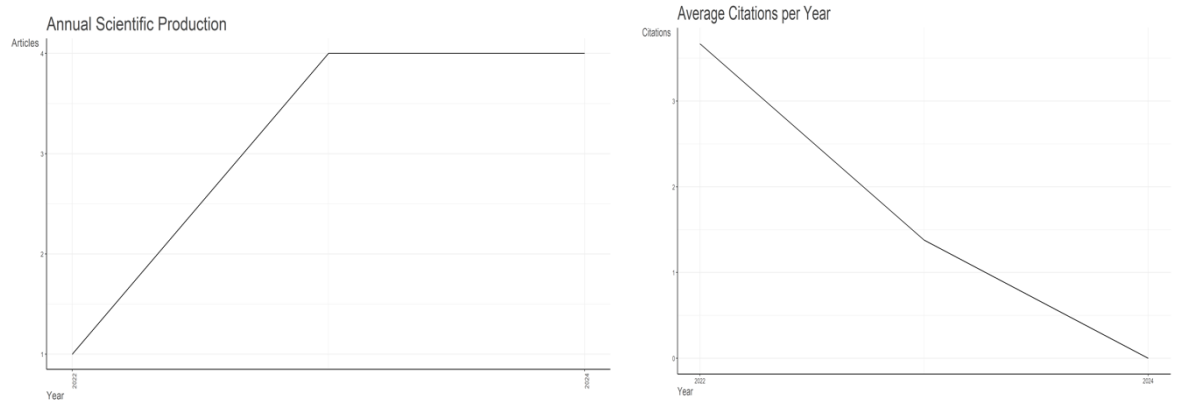

Figure 4. Annual scientific production and Average citations per year General statistical information on data (left), the trend in the number of articles (middle), and the number of citations (right)

Annual scientific production shows a significant increase in the number of articles published during this period. This increase reflects the rapid growth in research and publication activities. The trend graph shown in figure 4 (left) indicates a consistent year-on-year increase and peaks in 2024, indicating that the field of research continues to evolve and attract the attention of more researchers. The increase in the number of articles published is an indication of the surge in interest and contribution of the academic community to this topic, which is triggered by the relevance and urgency of the issue being studied.

Figure 4 (right) illustrates the increase in the number of citations, over time. This shows the relevance and influence of the published research. Publications from 2022 have gained recognition and have been referenced by other researchers, showing a greater impact than older works. It should be noted that citations tend to increase over time as more researchers access and use the work in their research.

Research Question 2: "Which countries and universities are making a major contribution to cyberbullying and metaverse research?"

2. Productivity and Impact of Countries and Institutions

The influence and contribution of publications from a country or institution can be analyzed through various bibliometric indicators. Figure 5 shows a Sankey diagram showing the relationship between the author, the keywords used, and the country from which the publication originated. This diagram makes it possible to understand how authors, research topics, and countries of origin relate to each other, as well as to provide insight into patterns of international collaboration in research.

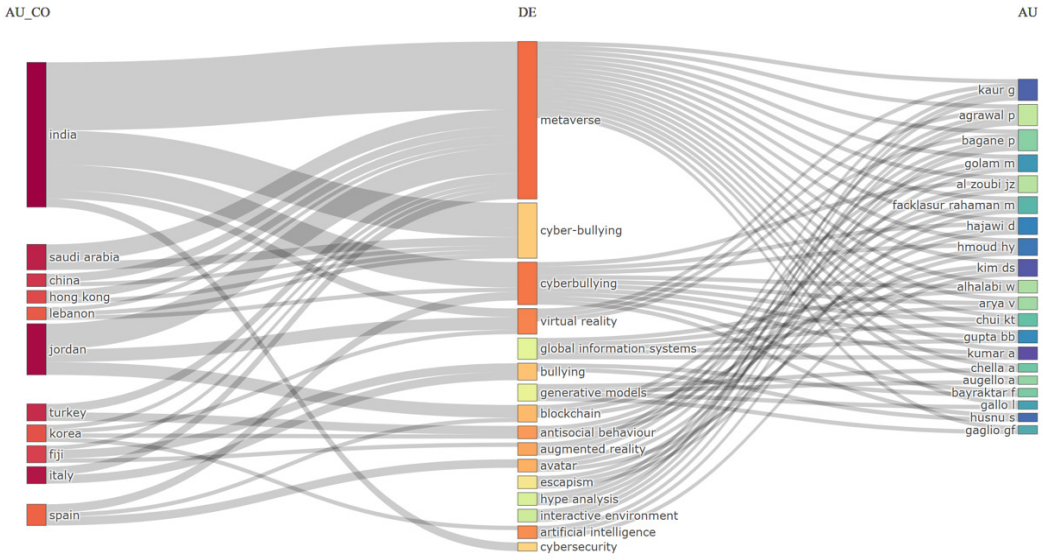

Figure 5. Three-field plot for countries of publications, keywords in abstracts, and authors

This diagram provides an overview of the relationship between leading countries and the keywords used in metaverse and cyberbullying research. The results of the analysis show that India leads in the publication of research on this topic, followed by countries such as Jordan, Saudi Arabia, Spain, Turkey, Korea, Fiji, Italy, China, Hong Kong, and Lebanon. This geographical distribution indicates a strong international collaboration in the fields of metaverse research and cyberbullying.

In the middle column, the larger red node shows the most frequently used keywords in the study, with “metaverse”, “cyber-bullying”, “cyberbullying”, “virtual reality” and “cybersecurity” as the main keywords. Other keywords that also appeared significantly included “global information systems”, “bullying”, “generative models”, “blockchain”, “antisocial behaviour”, “augmented reality”, “avatar”, “escapism”, “hype analysis”, and “interative intelligence”. These words reflect the main topics that are being explored.

On the right side of the chart, the most productive authors in this field are sorted by the number of articles published. The scatter plot shows that articles from India tend to adopt five of the sixteen main keywords namely “metaverse”, “cyber-bullying”, “cyberbullying”, “virtual reality”, and “cybersecurity”. On the other hand, articles from Jordan more often use three keywords, namely “metaverse”, “virtual reality”, and “blockchain”.

Some of the prominent authors who contributed to this study include Kaur G., Agrawal P., Bagane P., Golam M., Al Zoubi J.Z., Facklasur Rahaman M., Hajawi D., Hmoud HY., Kim D., Alhalabi W., Arya V., Chui K.T., Gupta B., Kumar A., Chella A., Augello A., Bayraktar F., Gallo L., Husnu S., and Gaglio G.F. The productivity of these authors demonstrates their active involvement in the development of research related to the metaverse and cyberbullying, which has contributed to the growth of global knowledge in this field.

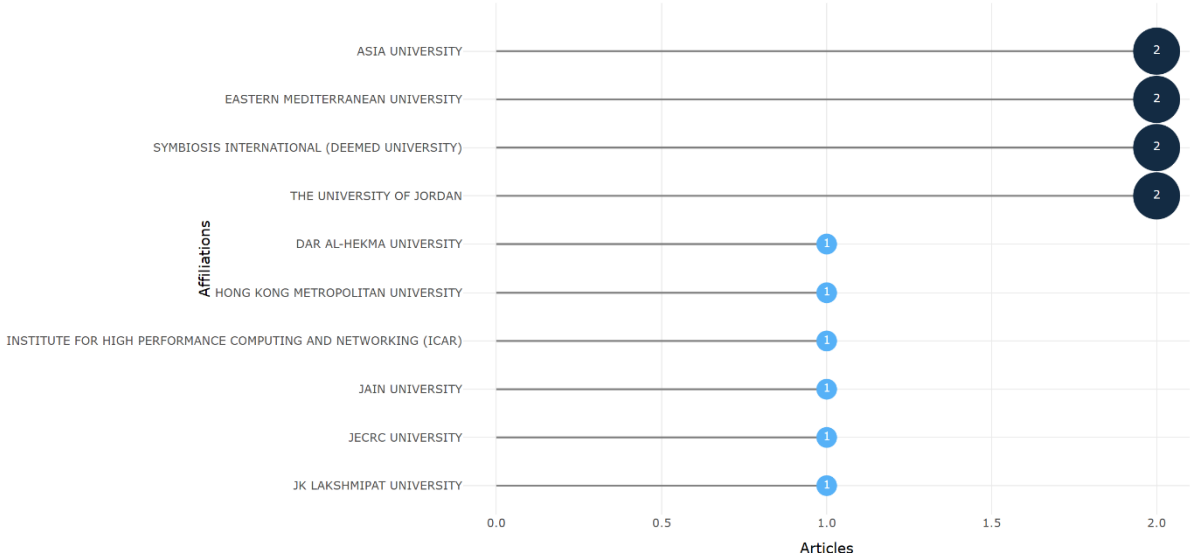

Figure 6. Top productive institutions in the world

Figure 6 highlights the ten main institutions that played a significant role in the publication of articles on the topic of cyberbullying and the metaverse during the period from 2022 to 2024. Of these institutions, four institutions each produced two articles, namely Asia University, Eastern Mediterranean University, Symbiosis International (Deemed University), and The University of Jordan. In addition, other institutional gymnastics, each published one article, including Dar Al-Hekma University, Institute for High Performance Computing and Networking (ICAR), Jain University, JECRC University, and JK Lakshmipat University. These findings show that research on cyberbullying and the metaverse has attracted attention from universities around the world, with the most notable contributions coming from institutions in Asia and the Middle East. These institutions are becoming major centers for the development of knowledge related to virtual world phenomena, demonstrating the growth of collaboration and strong interest in these topics in different parts of the world.

Research Question 3: "Which authors and sources have made major contributions to cyberbullying and metaverse research?"

3. Productivity and Impact of Sources and Authors

This section highlights authors who contributed to scientific publications. Productivity is measured based on the number of articles published by various sources as well as the number of works produced by individual or group authors.

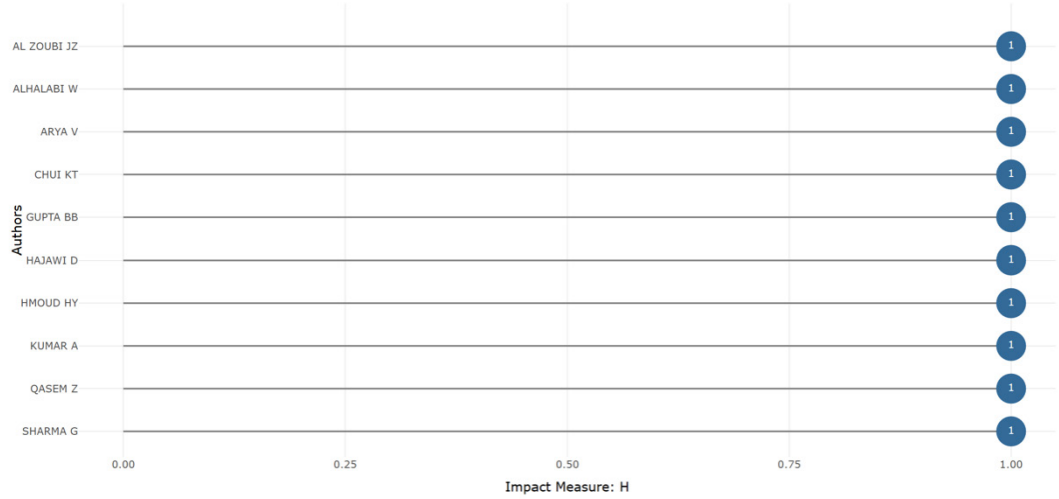

Figure 7. The connection author and publication sources

Figure 7 shows the productivity and impact of various authors, each of whom has contributed a single article to a scientific publication. The names of the authors mentioned, such as Al Zoubi JZ, Alhalabi W, Arya V, Chui KT, Gupta BB, Hajawi D, Hmoud HY, Kumar A, Qasem Z, and Sharma G, all have the same productivity figures. The impact indicator used is the h-index, which in this case is 1.00 for all authors. This indicates that each author has at least one publication that has received one citation. Although their productivity is limited (only one article), the fact that the article is cited suggests that their work has a certain impact in the academic community. To increase their influence in their fields, these writers need to increase both productivity and the number of citations in their works.

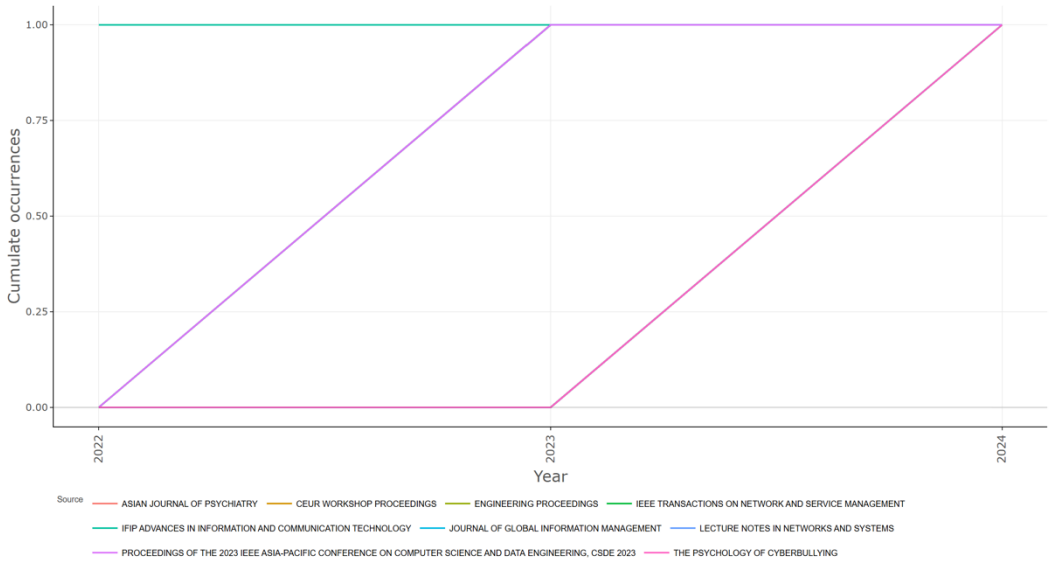

Figure 8. The connections between authors and publication sources

The cumulative connection between authors and publication sources reflects a network of scientific collaborations spread across various journals and conference proceedings. A total of nine publication

sources are the main publication sites for related research, with each publication source publishing one document from the 2022 to 2024 time span, covering a wide range of disciplines related to psychology, information technology, and network management. These sources include the Asian Journal of Psychiatry, CEUR Workshop Proceedings, Engineering Proceedings, IEEE Transactions on Network and Service Management, IFIP Advances in Information and Communication Technology, Journal of Global Information Management, Lecture Notes in Networks and Systems, Proceedings of the 2023 IEEE Asia-Pacific Conference on Computer Science and Data Engineering (CSDE 2023), and the Psychology of Cyberbullying. The connections between the authors and the various sources of this publication demonstrate the diversity of topics and multidisciplinarity occurring within the scientific community, as well as reflecting the broader impact of this research in a global context.

Research Question 4: "What is the dominant topic in cyberbullying and metaverse research?"

4. Distribution Keywords, Popular Topics, and Theme Development Trends

Keyword analysis in bibliometrics is often used in research to identify patterns and representations of specific topics that are of concern to researchers over time. The Biblioshiny program is used to analyze bibliometric data (Pathak and Singh, 2023), which helps measure how often key terms, topics, and trends come up together in various publications (Kirby, 2023).

Author keyword

Keywords plus

Title words

Figure 9. tren Author Keywords, keywords plus, and title words

The author keywords image is the result of the keyword analysis used, which describes a set of terms with large words, showing the keywords that are most often used by researchers and often appear in all research articles. The most frequently discussed keyword that became the main theme in the research article was the word "metaverse", followed by the keywords "cyberbullying", "virtual reality", and "artificial intelligence". There are also several other keywords, such as "cyber-bullying", "blockchain", "avatar", "augmented reality", "meta-governance", "mental health", "cybersecurity", "moral agents", "generative models", "non-player character", "physical reality", "bullying", "global information systems", "digital transformation", and "smart contracts". The keywords indicate areas that are closely related to this main

topic.

The keywords plus image shows the four most prominent terms: “metaverse”, “cyberbullying”, “computer crime”, and “virtual reality”. This emphasis on the plus keyword reflects an effort to explore the relationship between the use of technology and emerging social and criminal issues in digital contexts such as cyberbullying and bullying in the metaverse.

The title words image shows a text analysis that refers to the words that appear in the titles of research articles, to provide clues about the topic, focus, and main content of a document. The term can describe thematic relationships that represent latent trends in research on cyberbullying and the metaverse. Word clouds can effectively describe keywords in a study, but they are not enough to fully understand how important terms relate to each other and to the topic being researched (Rahaman et al., 2024).

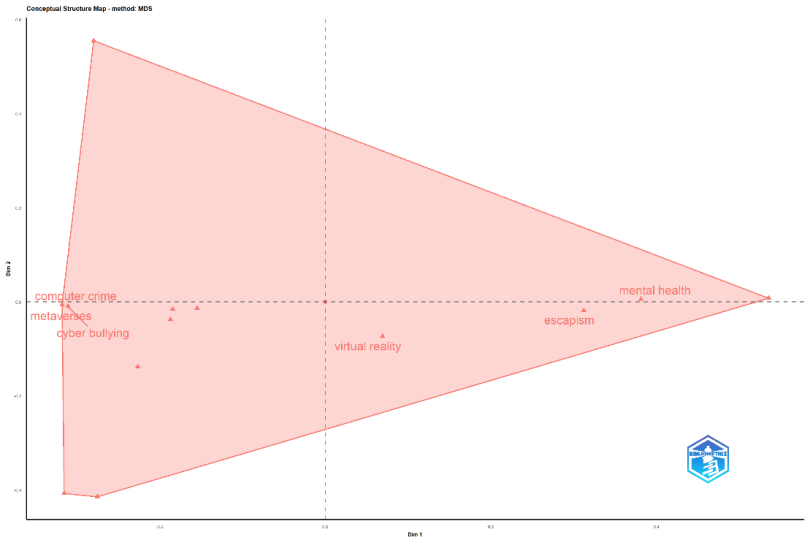

Figure 10. The conceptual structure of factor analysis

Figure 10 illustrates the conceptual structure of factor analysis that visualizes the relationship between concepts and ideas using a multidimensional approach (MDS). A variety of topics were found with the keywords “metaverse,” “cyberbullying,” “computer crime,” “virtual reality,” “mental health,” and “escapism.” In this diagram, the important terms are grouped based on their relevance in two dimensions of the analysis.

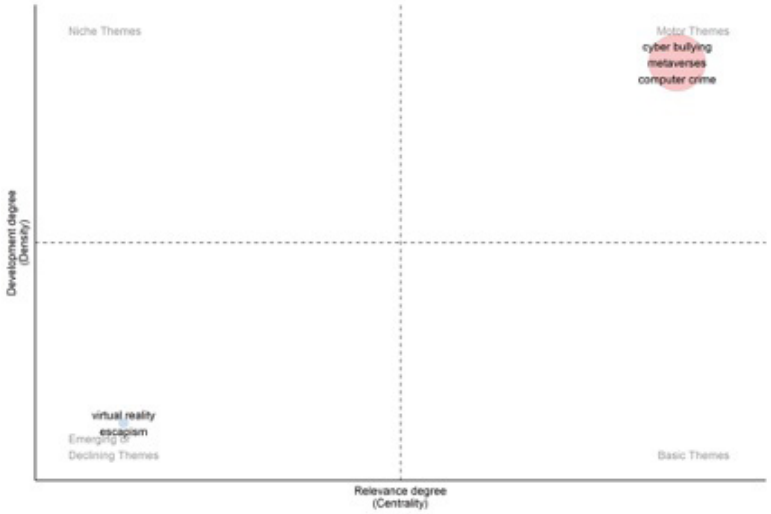

Figure 11. Thematic mapping from keywords

Figure 11 is a thematic map of the keywords in the research publication. This thematic map maps keywords based on two main axes, namely degree of relevance and degree of development. The diagram is divided into four quadrants, each of which depicts a different theme category. Quadrant 1 (top

right) contains three main themes, such as cyberbullying, metaverse, and computer crime. These themes have a high degree of centrality, which means a high level of relevance and density, indicating that these topics have developed well and become the center of attention in academic policy. Quadrant 2 (top left) represents special themes that have high density but low centrality. However, this quadrant does not show any themes. Quadrant 3 (bottom left) contains two themes that have low centrality and low density, such as "virtual reality" and "escapism." This suggests that over time, these topics declined and began to lose relevance in the study. Quadrant 4 (bottom right) contains basic themes that have high centrality but low density. In this quadrant, there are no themes. Thus, it can be concluded that the themes of "cyberbullying," "metaverse," and "computer crime" are the main and central themes in this study. Meanwhile, virtual reality and escapism are starting to decline and lose relevance in key research topics.

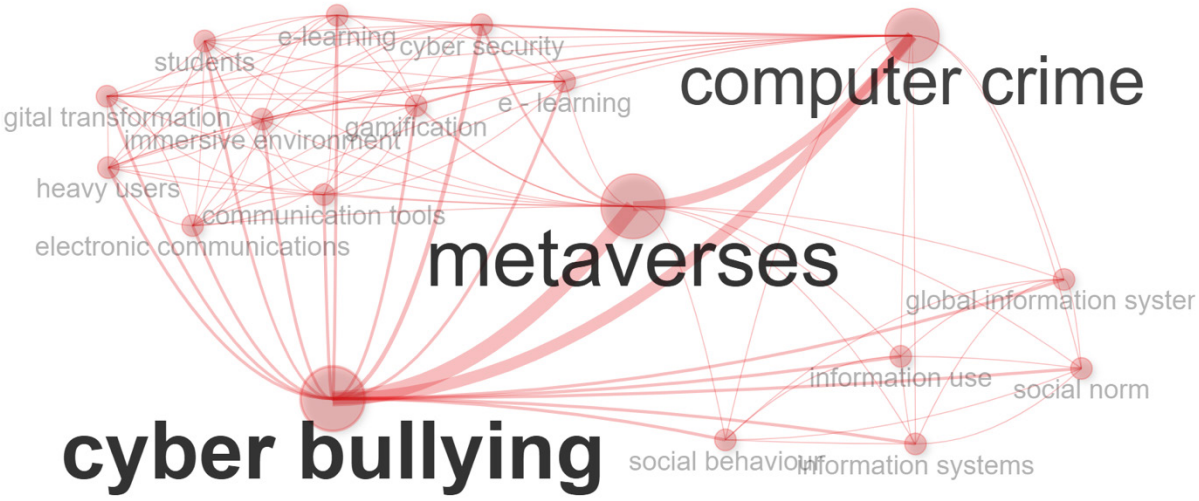

Figure 12. Co-occurence network from the topics

Figure 12 shows the network of linkages between the main topics in the study based on the concurrent occurrence of keywords in the analyzed article. The size of the circle indicates the importance of a keyword or topic, while the lines connecting the circles indicate the linkages or relationships between those topics. The large circle in Figure 12 shows that the topic of "cyberbullying" often appears in research articles. It shows that there are many connections with various other topics that are highly connected and relevant. Likewise, the topic of "metaverse" has a large circle, indicating that this topic is connected to cyberbullying, suggesting that there is a connection between the two. Computer crime is also a very relevant topic with the metaverse and cyberbullying, which shows that computer crime is often studied in the context of virtual and cybersecurity.

The lines that connect these topics illustrate connections such as "social behavior," "information systems," "information use," "social norms," and "global information systems," related to the main topic, thus showing that social behavior and information use are important factors in the discussion regarding cyberbullying, the metaverse, and computer crime. Apart from the main topic, there are several other keywords such as "e-learning," "cyber security," "gamification," "environment," "students," "communication tools," "electronic communications," "heavy users," "immersive," "digital transformation," and "students." This topic is a sub-theme in the research. The relationship between the topics of cyberbullying, the metaverse, and computer crime indicates that these three topics are interconnected and often appear together in the scientific literature.

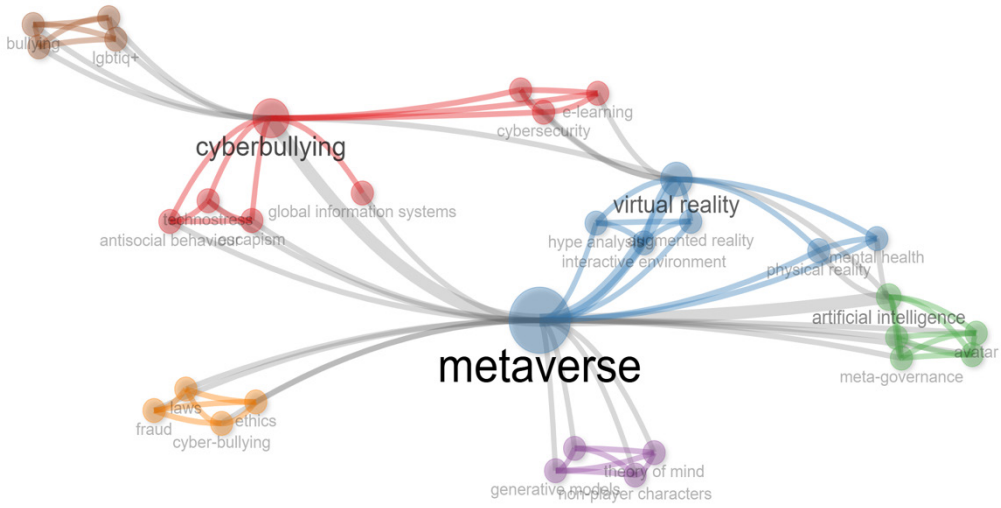

Figure 13. Co-occurence network from the topics

Figure 13 helps in identifying relevant research areas and shows how various topics are connected in the current literature. The network of associations seen in Figure 13 shows that the metaverse is a key topic that connects various research themes such as cyberbullying, virtual reality, and artificial intelligence. This relationship reflects research interest in the social, technological, and ethical implications of the growing virtual world.

Figure 14. Flow diagram of longitudinal thematic evolution

Figure 14 shows a thematic evolutionary analysis to track developments and dynamic changes in research themes focused on the metaverse and cyberbullying. Documents discussing these two themes were found from 2022 to 2024. On the left side of the image, it can be seen that in the 2022-2023 period, the most prominent and dominant keyword in the discussion in the research articles is the metaverse. Then, on the right side in the 2024-2024 period, there is a thematic shift with the emergence of additional keywords such as cyberbullying, which shows that the topic of research is starting to shift towards social problems that arise in the virtual world.

Discussions

The research aims to identify key trends and topics in the literature on cyberbullying and the metaverse, as well as describe the productivity of countries, institutions, authors, and publication sources. Related to cyberbullying and metaverse research, nine documents were found published from 2022 to 2024, with various types of documents, including three journal articles, one book chapter, four conference papers, and one letter. The diversity of these document types shows a multidisciplinary and substantial contribution in various academic forums. The research documents are still relatively new, with an average age of about 0.67 years, but have had an impact, with an average of 2,444 citations per document, showing a significant increase in the number of publications each year. This indicates that this topic is

increasingly attracting attention and showing a good initial influence in the scientific community. The nine published research papers each offer different but complementary perspectives in providing an overview of the dynamics of the virtual world and its implications for social behavior in technology.

Research on cyberbullying and the metaverse has reached a global scale, each highlighting important issues in their contexts. Rusyidi (2020) revealed that cyberbullying has become a global issue with a negative impact on victims. Meanwhile, Koohang (2023) shows that the metaverse, as an immersive virtual platform, has potential applications in various sectors. However, although both of these topics have gained significant attention, research linking cyberbullying to the use of the metaverse is still very limited. Currently, these studies tend to be separate, each focusing on impact and potential in different contexts without exploring the linkages between the two. Advances in digital technology have resulted in new forms of bullying, including cyberbullying on social media platforms (Riswanto and Marsinun, 2020). Recently, with the emergence of the metaverse as a 3D virtual space, there are new opportunities and challenges in the field of education (Indarta et al., 2022), especially in non-cognitive aspects such as social skills and self-control (Muslihati et al., 2023). Therefore, there is still an urgent need for research that integrates these two fields to understand how the use of the metaverse can affect cyberbullying behavior and its impact on social interactions in the virtual world.

The issue of cyberbullying and the metaverse has become a global topic trend, marked by international collaboration in the development of this research. Geographically, the State of India leads in terms of the number of publications, followed by Jordan, Saudi Arabia, Spain, Turkey, and other countries. This is in line with the results of bibliometric analysis (Aguspriyanti, 2023), which has highlighted emerging trends in digital public space research, with Western countries leading the way in publications. Global interest in this topic reflects the primary focus of research on the impact of technology on social behavior and safety in the virtual world. Social behavior towards cyberbullying among adolescents has been extensively researched, emphasizing the importance of parental supervision in reducing problematic social media use (Fazry and Apsari, 2021). It is characterized by keywords that often appear in research, such as “metaverse,” “cyberbullying,” “virtual reality,” and “cybersecurity.” Likewise, the contribution of institutions from Asia and the Middle East shows the diversity of topics discussed, including the disciplines of science and technology, education, network management, and psychology.

The main focus of the research based on thematic mapping reveals that the themes of cyberbullying, the metaverse, and computer crime are the primary focuses of the research, while virtual reality and escapism tend to decrease in relevance. The following is an explanation related to the research article document discussed:

1. Research (Kaur, G., et al., 2024) “A Comprehensive Review of Metaverse: Taxonomy, Impact, and the Hype around It” reveals that the metaverse is not only a trend, but also has the potential to change social interactions, including increasing the risk of cyberbullying. The study provides a theoretical foundation about the metaverse by developing a taxonomy and exploring its impact in general.
2. Research (Upadhyay et al., 2023) “cyberbullying in the metaverse: A prescriptive perception on global information systems for user protection” shows the urgency of developing a virtual world user protection mechanism to deal with cybercrime, including cyberbullying in the metaverse.
3. Research (Grover et al., 2023) “Social Commerce and Metaverse in a New Virtual World: Exploring Women’s Adoption Intentions” Her study contributes to revealing the potential of the metaverse as a social and economic platform, but is vulnerable to the threat of cyberbullying, especially among women.
4. Research (Pathak-Shelat and Mehta, 2023) “The Future of Higher Education in Ethical Metaverse: Co-existing in Virtually Enhanced Physical Reality” discusses the role of institutions in combating cyberbullying behavior in an ethical metaverse through an ethical-based approach, by introducing an education system that is its bulwark.
5. Research (Yildiz, I. and Tanyildizi, N.I., 2022) “An analysis on news containing cyberbullying in the metaverse” shows that the public perception of the risks of cyberbullying in the metaverse is beginning to develop. The analysis is based on the representation of cyberbullying in the metaverse through media coverage, so it can help validate the importance of raising awareness of the dangers lurking in the virtual world.
6. Research (Qasem et al., 2022) “The effect of technostress on cyberbullying in metaverse social

platforms" investigates the relationship between technostress and cyberbullying, the results of which can strengthen the understanding of behaviors that can trigger cyberbullying in the digital environment. This research is very relevant because it links stress due to technology with an increased risk of negative behavior on metaverse social platforms.

7. Research (Sanchez-Romeo, C. and Munoz-Jimenez, E.M., 2024) "Immersive environments at school: stop cyberbullying by proximity" offers virtual proximity-based solutions used to combat cyberbullying. This study is relevant in the context of Education to mitigate cyberbullying behavior among students. It emphasizes that the same technology that can be used to harm, can also be used to protect.
8. The research (Rahaman et al., 2024) "Meta-Governance: blockchain-driven metaverse platform for mitigating misbehavior using smart contracts and AI" introduces the potential of innovative technologies to address bad behavior in the metaverse using blockchain and smart contracts. Not only monitoring but also automatically controlling negative behavior on the metaverse platform.
9. Research (Bayraktar, F. and Husnu, S., 2024), "Risk and protective factors in LGBTIQ+ Cybervictimization" This study shows that vulnerable communities become victims of negative behavior, such as the LGBTIQ+ community in the metaverse, so they need special protection in a virtual environment.

Each study offers a different but complementary perspective. The study conducted by Kaur et al. (2024) provides a holistic view of metaverse trends, while more focused research, such as that conducted by Upadhyay et al. (2023) and Yildiz and Tanyildizi (2022), explores user protection against the risks of cyberbullying and bullying in the metaverse. At the same time, Grover et al. (2022) conducted a study on the adoption of the metaverse in the context of social commerce. This is reinforced by research from Bayraktar and Husnu (2024), which reveals that the threat of cyberbullying is particularly vulnerable to the LGBTIQ+ community, indicating that a comprehensive approach is needed in the virtual world. Several innovative solutions have been proposed by researchers, such as those proposed by Rahaman et al., 2024Facklasur et al. (2024) with the use of blockchain and AI, as well as by Pathak-Shelat and Mehta (2023) through the application of ethical approaches. Both studies provide solutions to protect against negative behavior in the virtual world through the involvement of technology.

Future research is expected to increase international collaboration and exploration of relevant topics. The metaverse is predicted to make a significant contribution to global GDP growth, with applications in education, health, business, and entertainment (Syahrul and Baidarus, 2023). In education, the metaverse offers an interactive online learning experience, overcoming limitations such as classroom capacity and distance constraints (Setiawan, 2022). However, the emergence of digital technology also raises concerns about cyberbullying, which can have psychological and physical impacts on victims (Fathoni and Prasodjo, 2022). Research on cyberbullying and the metaverse is still limited, and there are many other aspects that have not been developed, such as the exploration of its impact on antisocial behavior, policy interventions in the educational environment, and the transformation of cyberbullying into bullying in the metaverse.

Conclusions

The topic of cyberbullying and the metaverse has become a significant global concern. The findings show that India made a major contribution to the publication of the study, followed by Jordan, Saudi Arabia, Turkey, Korea, Fiji, Italy, China, Hong Kong, and Lebanon. Various universities in these countries are leading in the production of research in this field. Key authors and leading journals also play an important role in the dissemination of related research. The analysis shows an increase in publications related to these two topics, with the discovery of nine still relatively recent documents published between 2022 and 2024. These documents, such as journal articles, books, and conference papers, deal extensively with the impact of technology on social behavior in the virtual world. Themes such as cyberbullying, the metaverse, virtual reality, and cybersecurity dominate the literature. However, research linking these two topics is still limited and separate. Therefore, it is important to recognize the urgent need for research that integrates these two fields. The metaverse brings new challenges, especially when it comes to cyberbullying and its impact on social interactions. Future research should expand this study by exploring the transformation of cyberbullying into bullying in the metaverse environment, as well as developing effective policy interventions in the field of education to address this problem.

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Conflict of interests

The authors declare no conflict of interest.

Author Contributions

Conceptualization, H.A. and A.M.; methodology, A.M. and H.H.; software, H.A., A.M. & H.H; statis- tical analysis and interpretation, and writing; E.P. and M.N.W.; supervision and critical revision, and editing.

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